US 20070234505A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0234505 A1**

Gordon et al. (43) **Pub. Date: Oct. 11, 2007**

(54) **MODE CONTROL ARRANGEMENT FOR A FLOOR CARE APPLIANCE**

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(21) Appl. No.: **11/398,317**

(22) Filed: **Apr. 5, 2006**

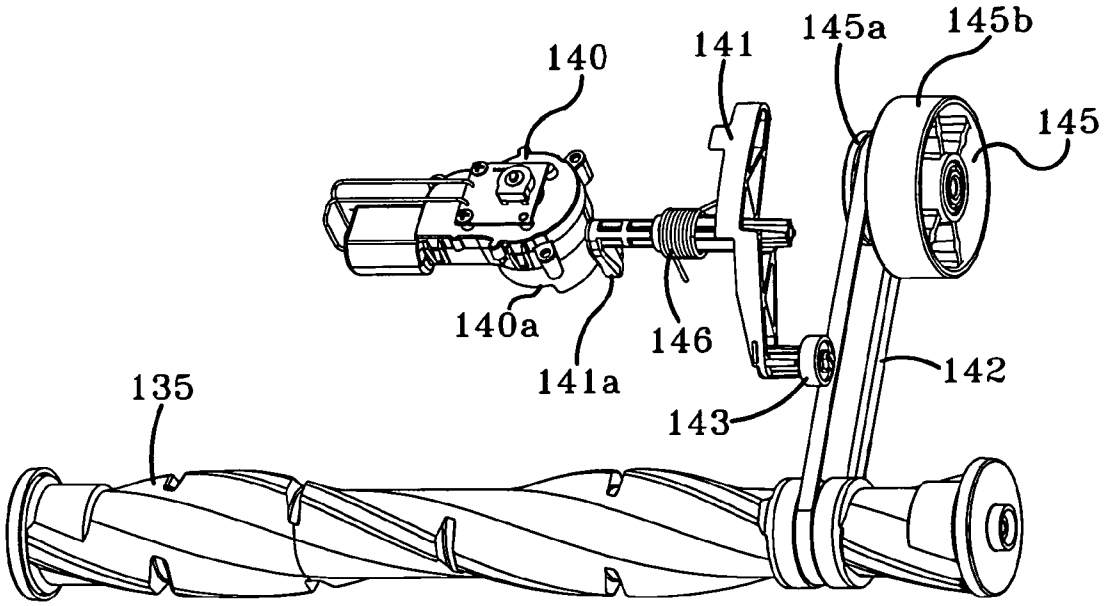
Publication Classification

(51) **Int. Cl.**
A47L 5/34 (2006.01)

(52) **U.S. Cl.** **15/354**; 15/339; 15/390

(57) **ABSTRACT**

An upright vacuum cleaner is provided having a suction nozzle height adjustment arrangement controlled by a rotary mode control member located on the upper housing. The rotary mode control member controls a suction nozzle height adjustment motor and a rotary agitator drive disconnect arrangement. A wheel tensioner located on an idler arm is operatively connected to a cam on the suction nozzle height adjustment motor which tensions and de-tensions the agitator drive belt to control the rotary agitator. The rotary mode control member could have discrete settings for the various floor surfaces to be cleaned including bare floors and carpet of varying pile heights. Alternately, the rotary mode control member could be variable so that an infinite number of suction nozzle height settings can be selected.



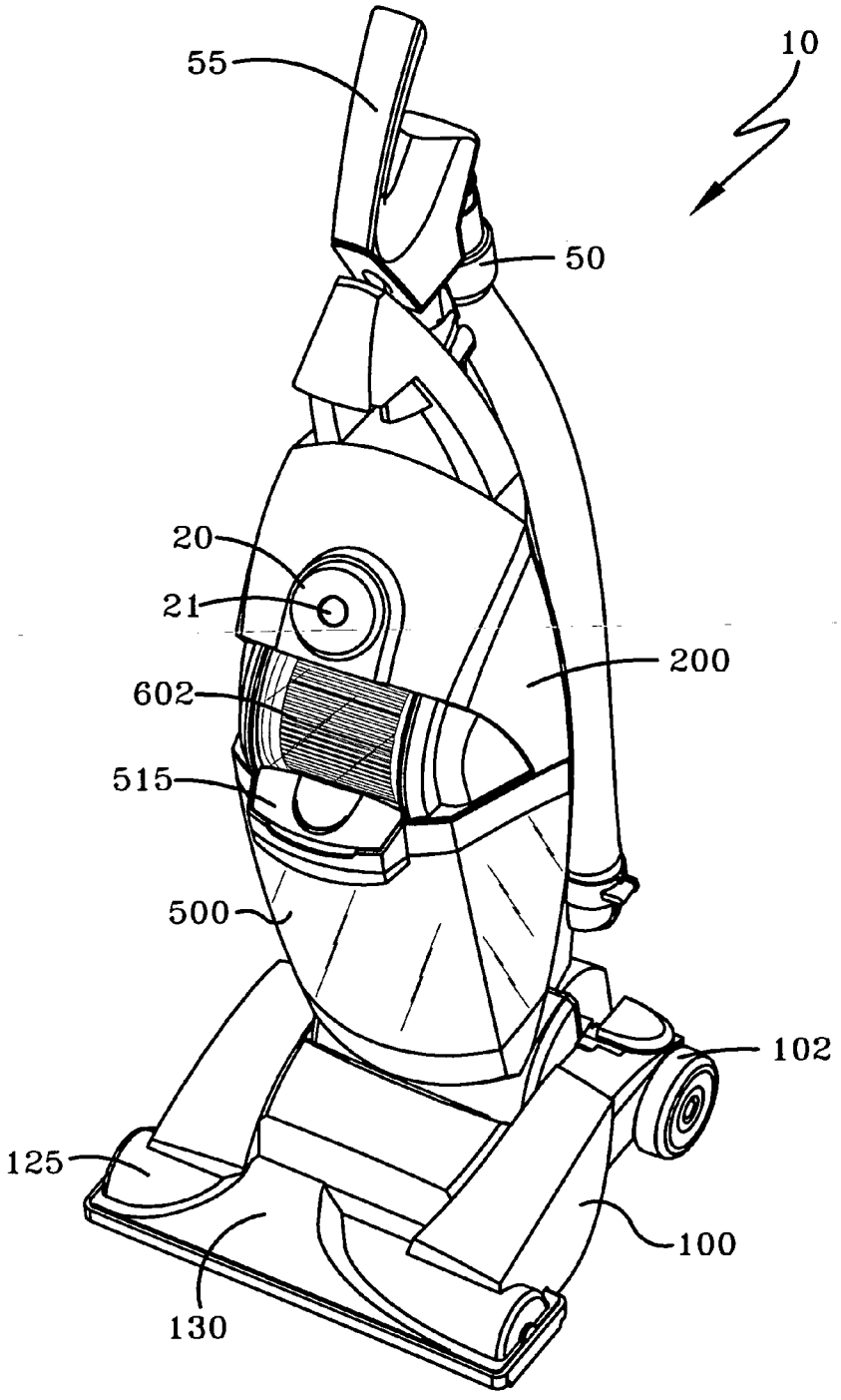


FIG-1

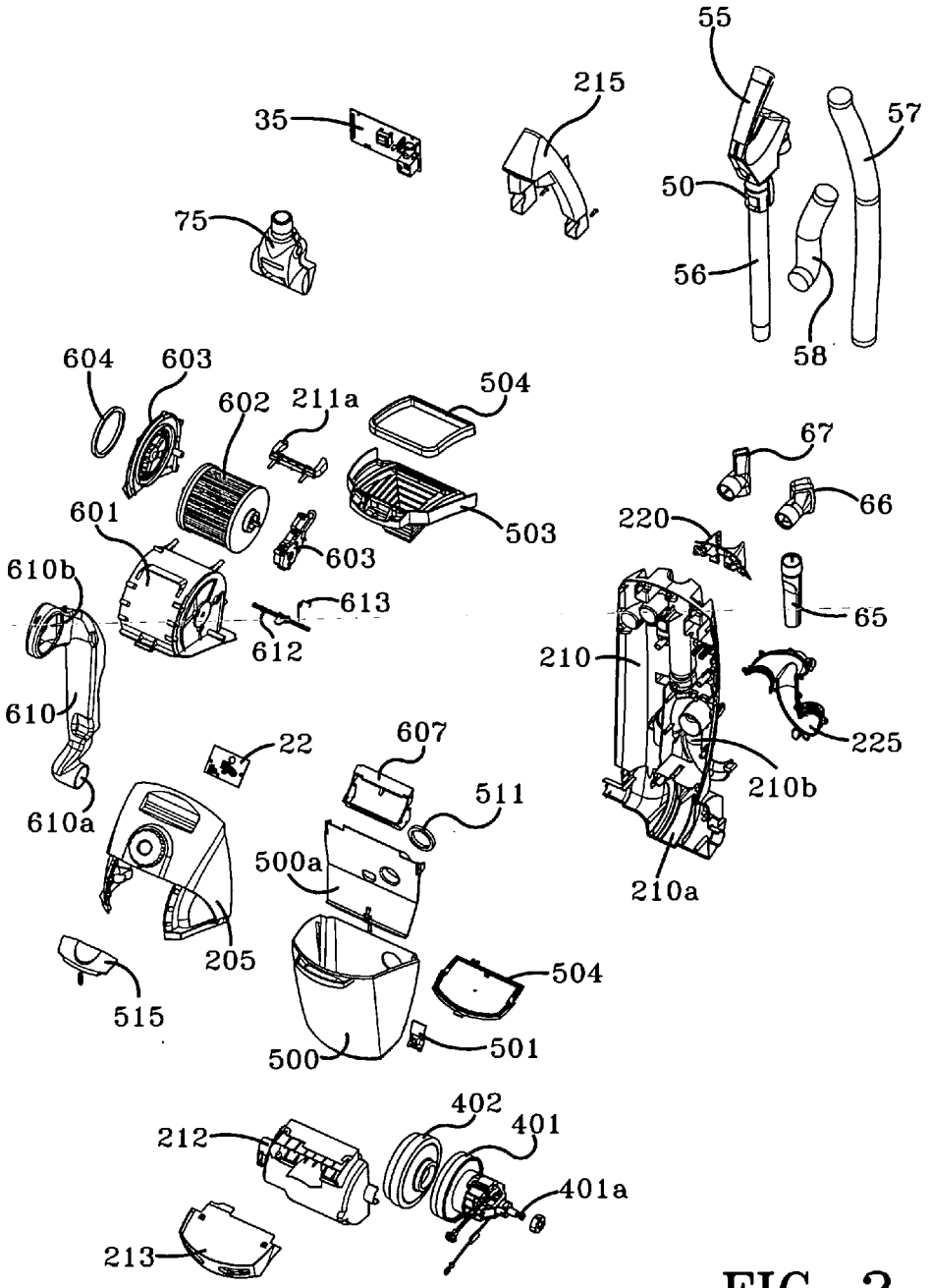

55
215
35
57
50
75
56
58
604
603
602
211a
504
67
66
601
503
220
603
610b
613
65
612
210
610
225
607
22
210b
511
610a
500a
210a
205
504
515
501
500
402
212
401
401a
213

FIG-2

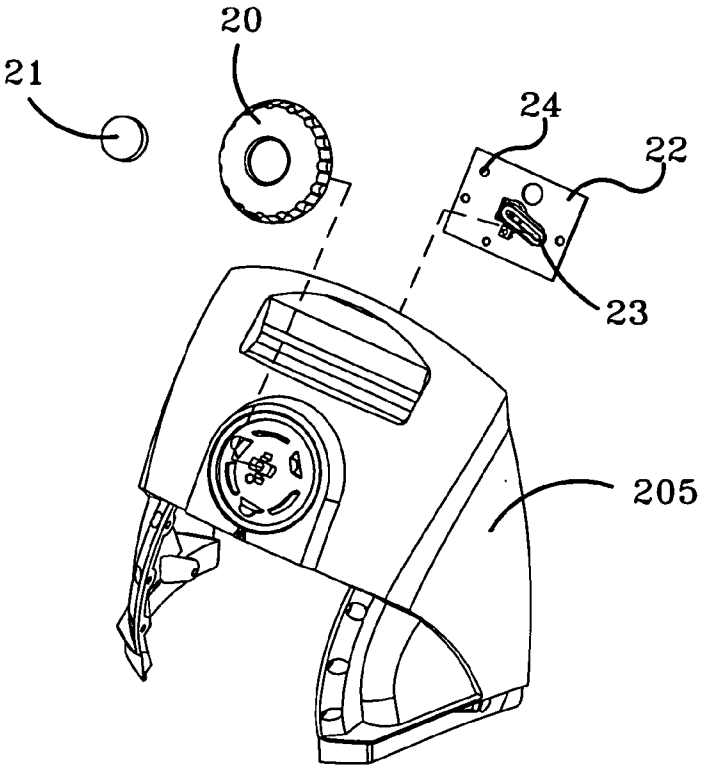

20
21
24
22
23
205

FIG-2A

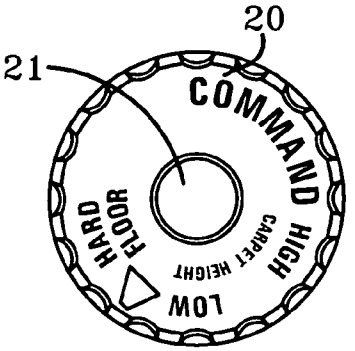

20
21
COMMAND
HIGH
CARPET HEIGHT
LOW
HARD FLOOR

FIG-2B

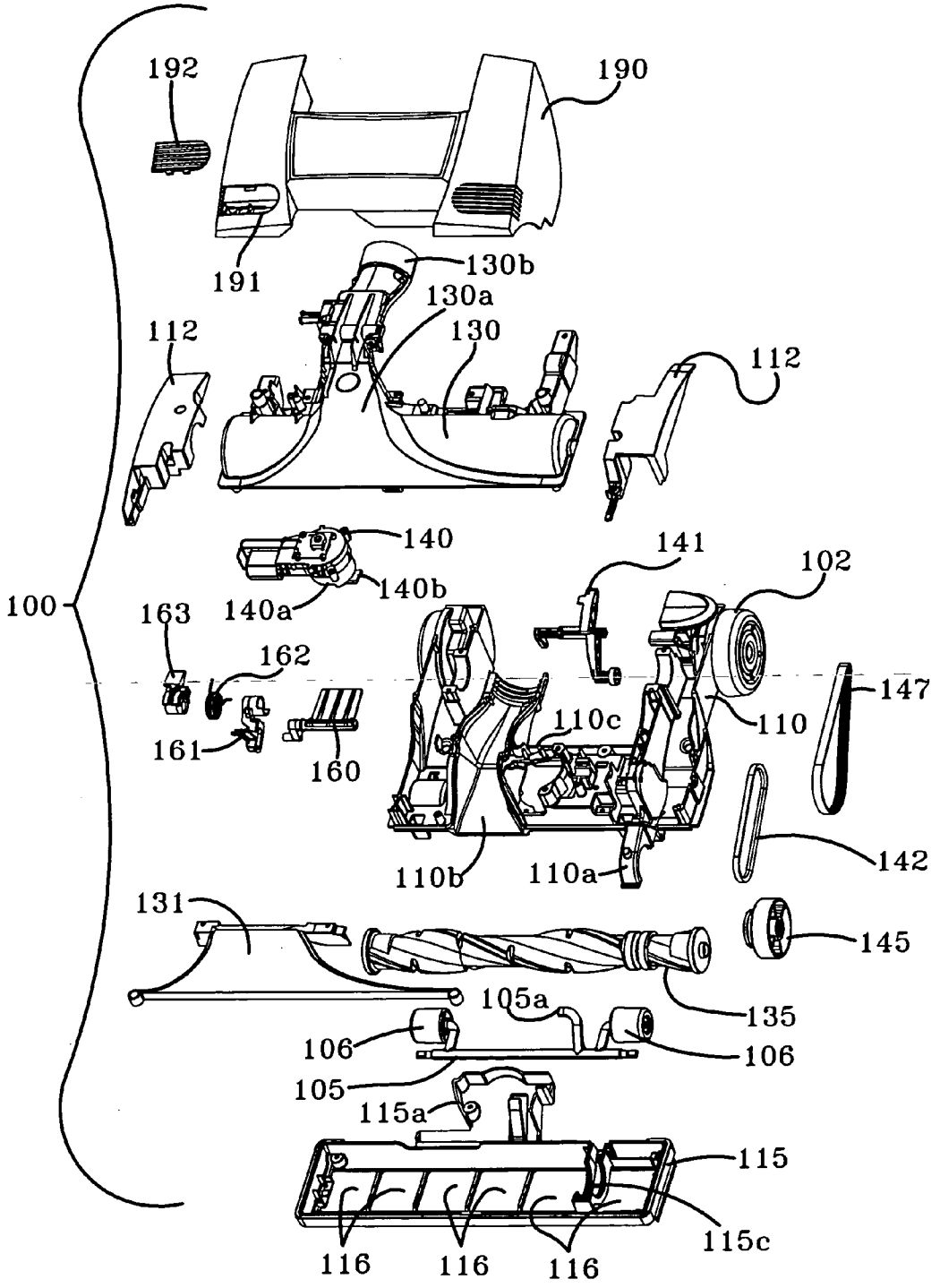

192
190
191
130b
130a
130
112
112
140
140b
140a
141
102
100
163
162
161
160
110c
110
147
110b
110a
142
131
145
105a
135
106
106
105
115a
115
115c
116
116
116

FIG-3

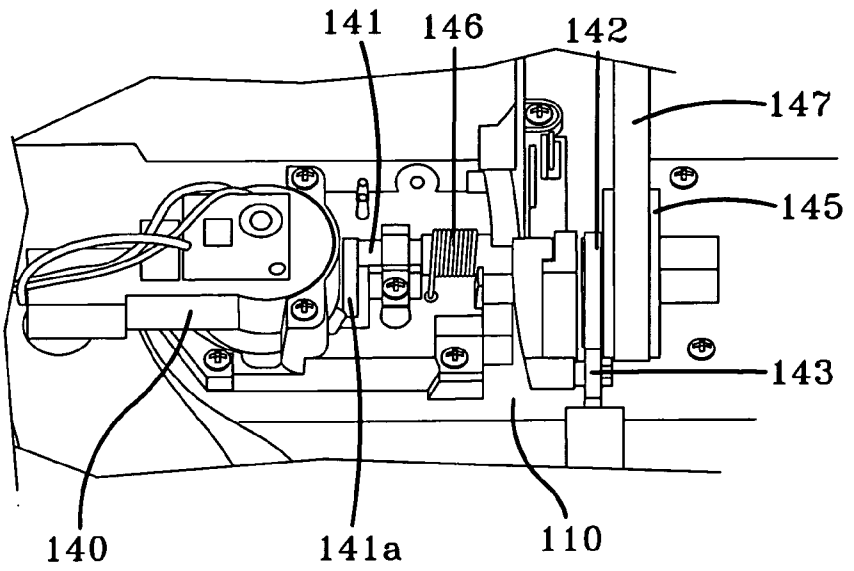

141
146
142
147
145
143
140
141a
110

FIG-3A

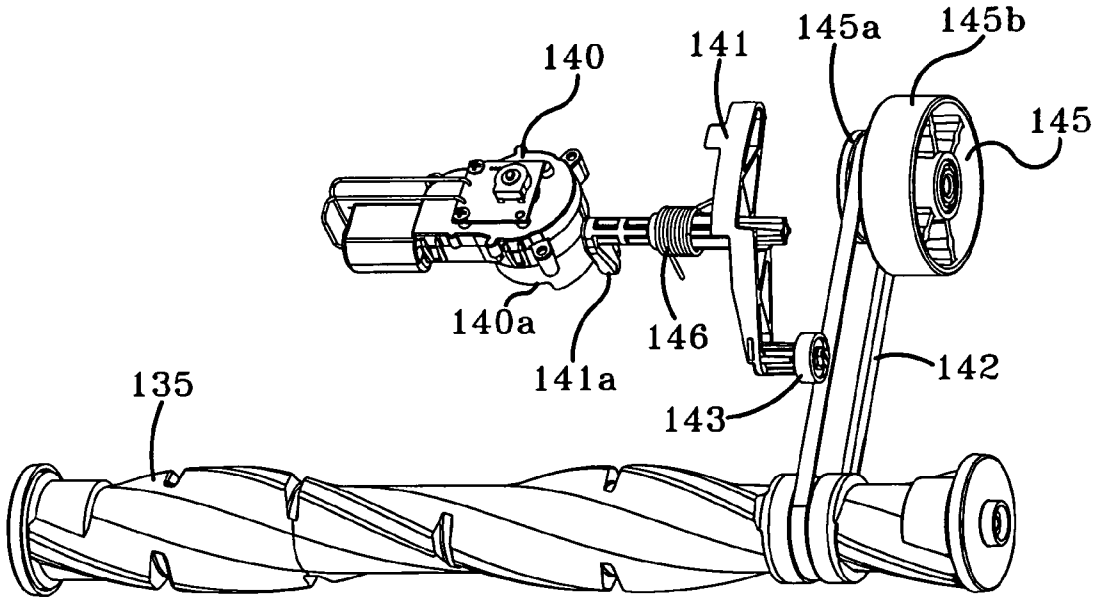

140
141
145a
145b
145
140a
146
141a
142
135
143

FIG-3B

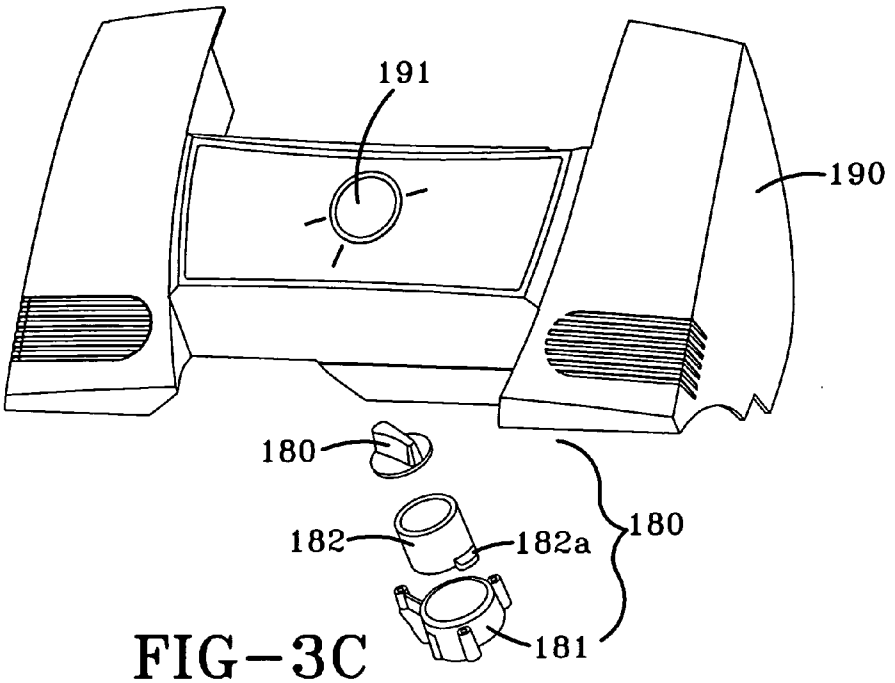

191
190
180
182
182a
180
181

FIG-3C

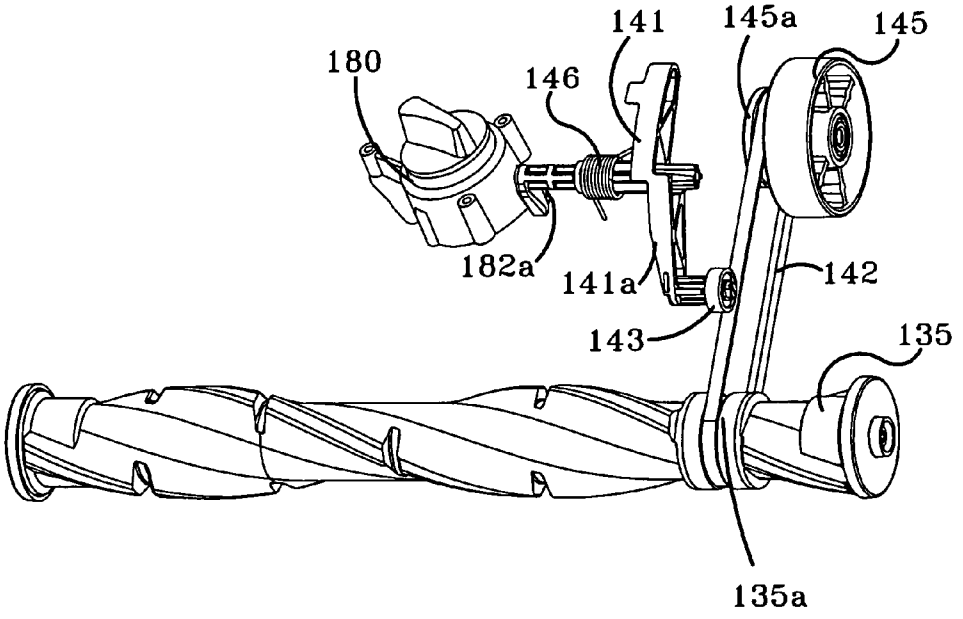

141
145a
145
180
146
182a
141a
142
143
135
135a

FIG-3D

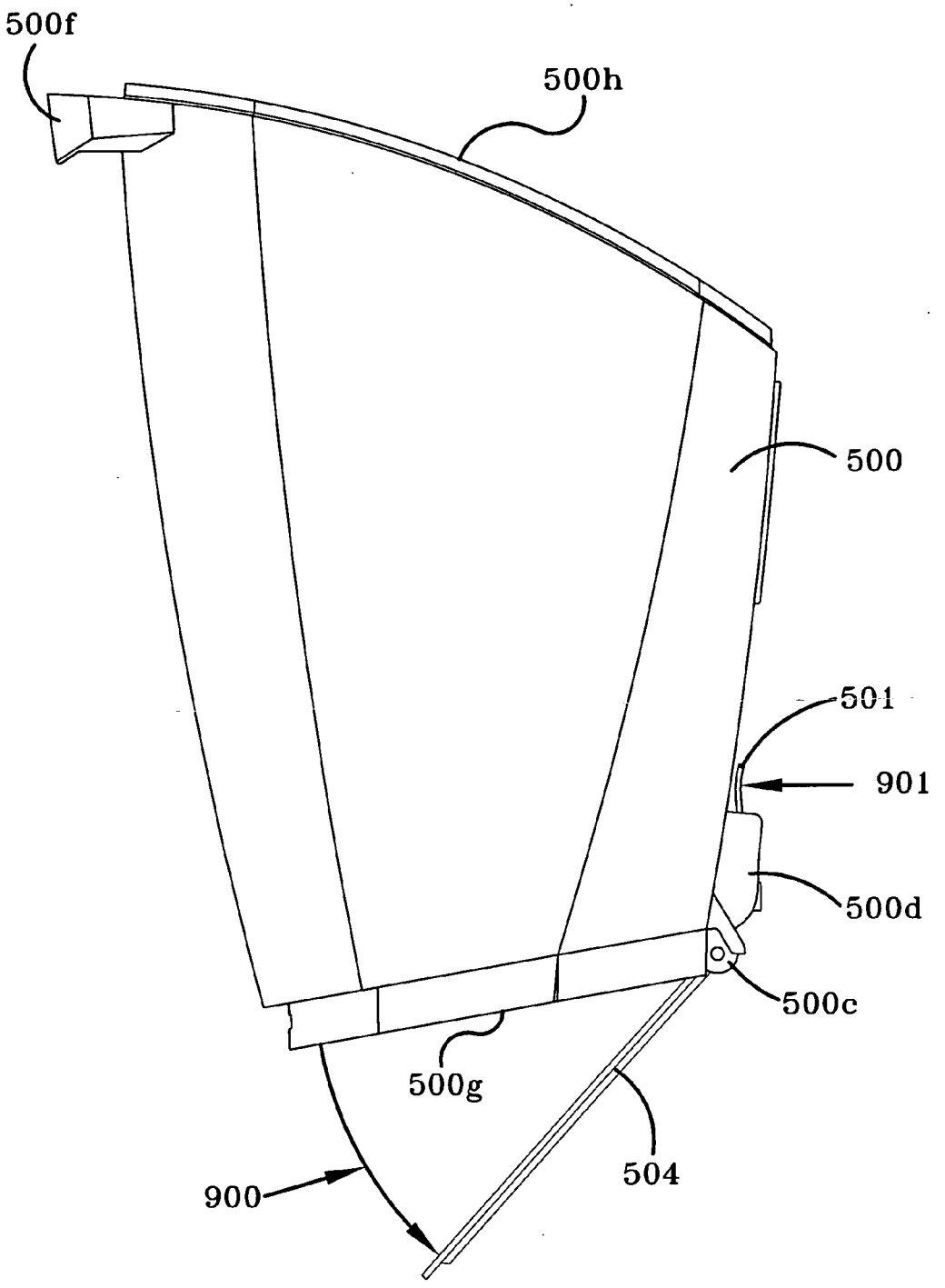


FIG-4

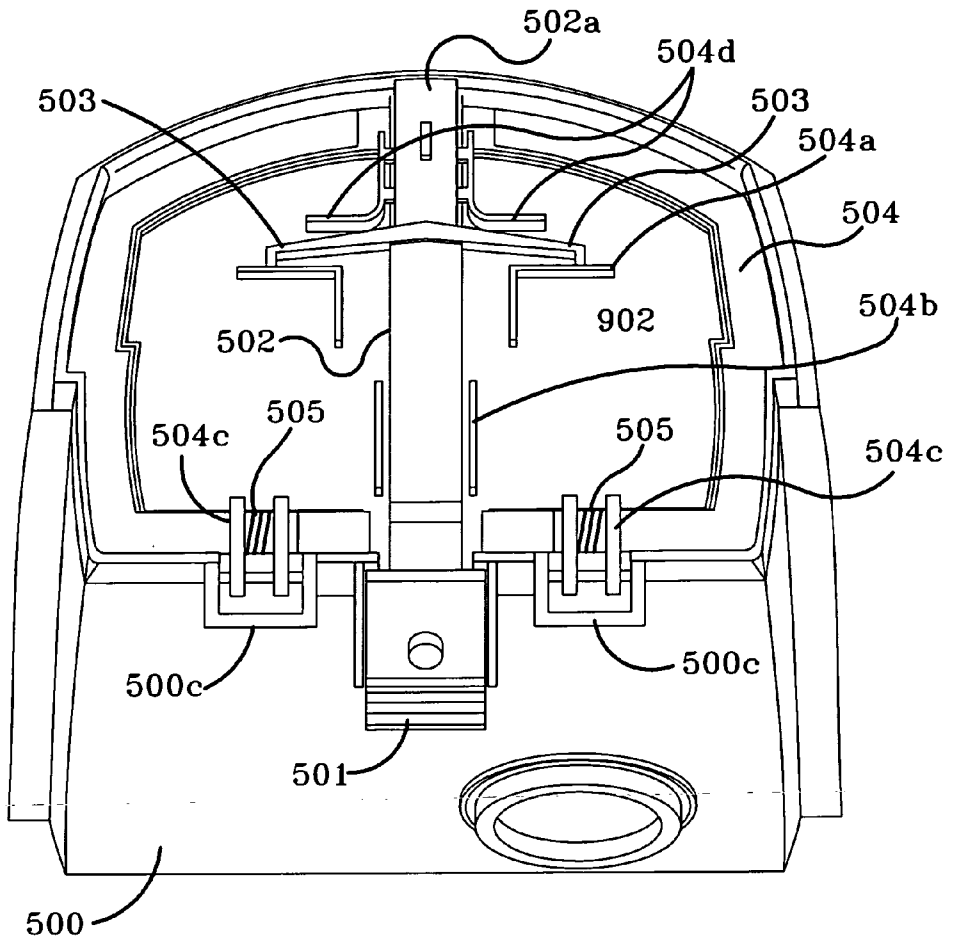

502a
504d
503
503
504a
504
902
504b
502
505
504c
505
504c
500c
500c
501
500

FIG-4A

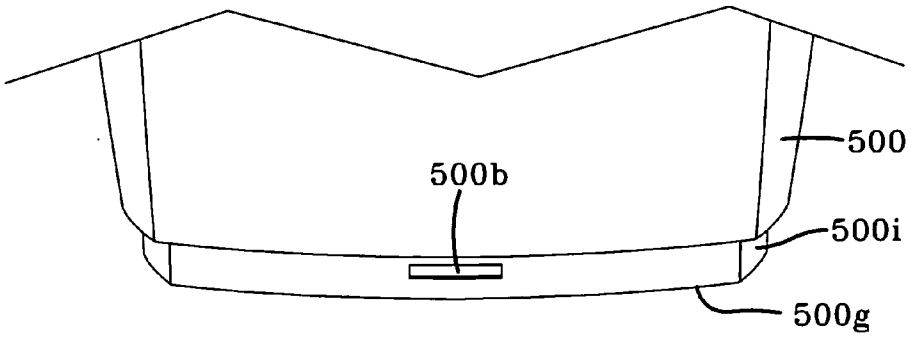
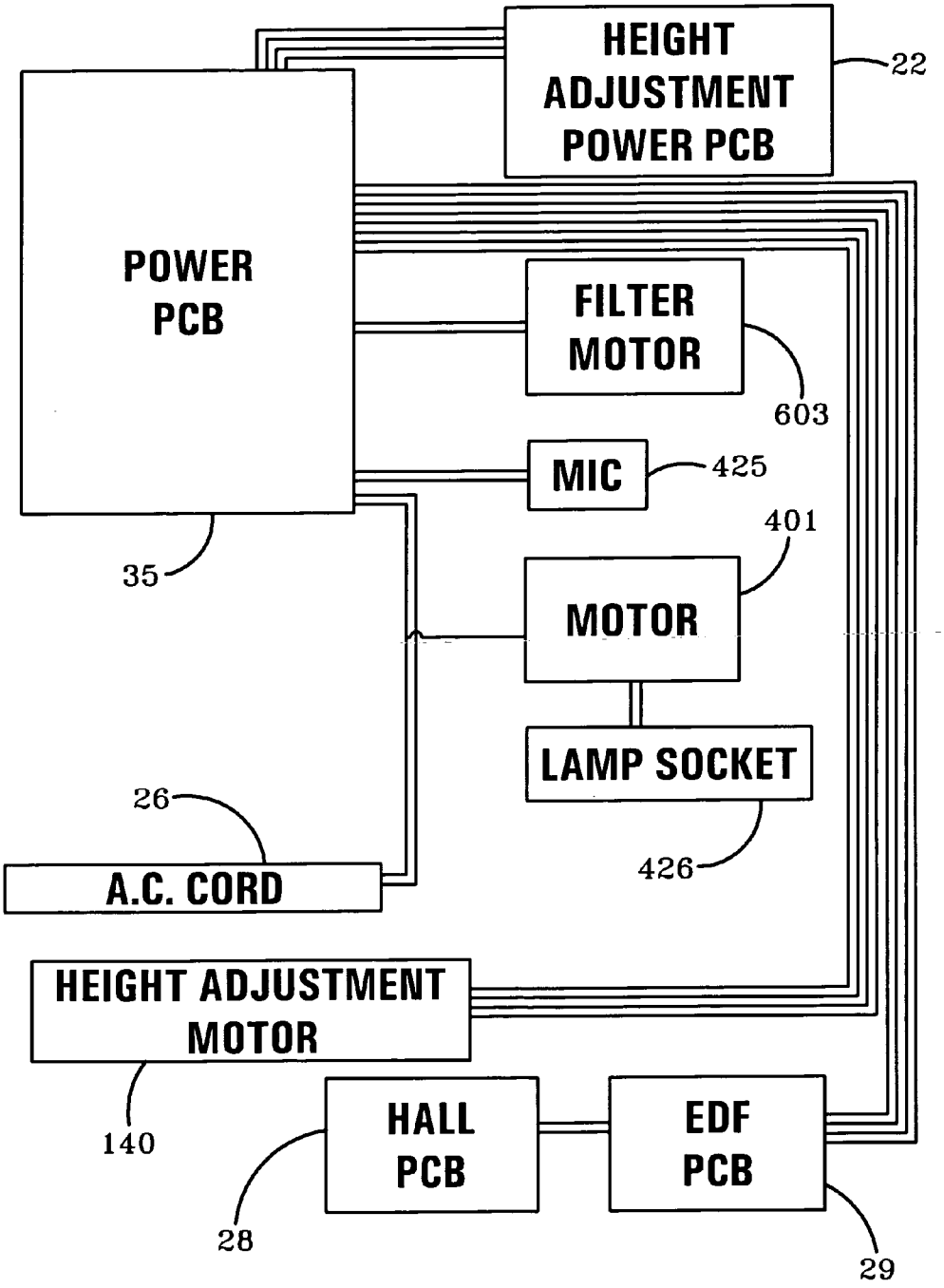

500
500b
500i
500g

FIG-4B


HEIGHT ADJUSTMENT POWER PCB
22
POWER PCB
FILTER MOTOR
603
MIC
425
401
35
MOTOR
LAMP SOCKET
26
426
A.C. CORD
HEIGHT ADJUSTMENT MOTOR
140
HALL PCB
EDF PCB
28
29

FIG–5

MODE CONTROL ARRANGEMENT FOR A FLOOR CARE APPLIANCE

FIELD OF THE INVENTION

[0001] Generally, the invention relates to vacuum cleaners. Particularly, the invention relates to a rotary mode control arrangement for a floor care appliance such as an upright vacuum cleaner.

BACKGROUND OF THE INVENTION

[0002] It is known to produce an upright vacuum cleaner with controls for controlling the operation of the motor-fan assembly, the height of the suction nozzle in relation to the floor surface, and for turning the rotary agitator on and off. There are many such cleaners having various manual or electronic controls or a combination thereof for controlling these features individually or in conjunction with one another as a system according to pre-determined settings.

[0003] In recent years, it has been found to be advantageous to produce a floor care appliance with one or more modes wherein one of the modes will be used for cleaning bare floors. In bare floor mode, it is desirous to either manually or automatically lower the suction nozzle of the vacuum cleaner to the lowest position in relation to the floor surface while simultaneously disconnecting the rotary power to the rotary agitator. Disconnecting the rotary agitator prevents the rotating agitator from damaging the floor surface. It has also been found to be desirous to vary the height of the suction nozzle according to the type of floor surface being cleaned by utilizing a rotary control dial or member having either discrete settings or variable positions. In this manner, a suction nozzle height setting may be selected according to the type floor surface or type of carpet to be cleaned. Heretofore, it is unknown to have a floor care appliance utilizing a rotary control member to control the height of the suction nozzle and to control the rotary agitator according a pre-determined position of the rotary control member

[0004] In the present invention, a rotary mode control member electronically controls a suction nozzle height adjustment motor. The suction nozzle height adjustment motor has a cam portion which adjusts the height of the suction nozzle by urging against a lever arm on the wheel carriage supporting the suction nozzle on the floor surface. A projection extending from the cam portion is operatively linked to an idler arm having a belt tensioner for tensioning and de-tensioning the agitator drive belt according to a pre-determined height of the suction nozzle. Thus, the rotary control member can be moved to a position to lower the suction nozzle closest to the floor surface and turn off the rotary agitator ortho other positions where the suction nozzle is moved to a pre-determined height above the floor surface and the drive belt is tensioned so that rotary power is provided to the rotary agitator. Therefore, the present invention fulfills a need not heretofore addressed in the prior art.

SUMMARY OF THE INVENTION

[0005] In carrying out the invention in one aspect thereof, these objectives and advantages are obtained by providing a floor care appliance such as vacuum cleaner having a rotary mode control member located on the upper housing for controlling the height of the suction nozzle and to control the rotary agitator according to a pre-determined position of the rotary control member. The rotary mode control member includes a first position for cleaning bare or hard floors wherein the suction nozzle is lowered to the closest position in relation to the floor surface and the rotary agitator is turned off. The rotary mode control member also includes a second position for cleaning deep pile height carpet wherein the suction nozzle is raised to the highest position in relation to the floor surface and the rotary agitator is turned on. The rotary mode control member also includes one or more positions between said first and second positions for moving the suction nozzle to the proper height for cleaning carpet of various pre-determined pile heights and wherein the rotary agitator is turned on. The rotary mode control member is operatively linked to a suction nozzle height adjustment motor which raises and lowers the suction nozzle according to the position of the rotary mode control member. A cam portion extending from the suction nozzle height adjustment motor urges against a lever arm extending from the wheel carriage supporting the suction nozzle for raising and lowering the suction nozzle. A projection also extends from said cam portion for engaging an idler arm which has a wheel tensioner extending therefrom for tensioning and de-tensioning a drive belt transmitting rotary power from the motor-fan assembly to the rotary agitator. The projection urges said lever arm to cause said wheel tensioner away from said drive belt when said suction nozzle is moved to the lowest or bare floor position. This causes the rotary power from said motor-fan assembly to be disconnected from said rotary agitator. The idler arm and wheel tensioner are released when said suction nozzle is moved to one of the other pre-determined positions by moving said rotary mode control member. The rotary mode control member is operatively connected to a microprocessor which is pre-programmed with data for controlling said suction nozzle height adjustment motor to one of the pre-determined height positions.

BRIEF DESCRIPTION OF DRAWINGS

[0006] Embodiments of the invention, illustrative of several modes in which applicants have contemplated applying the principles are set forth by way of example in the following description and are shown in the drawings and are particularly and distinctly pointed out and set forth in the appended claims.

[0007] FIG. **1** is a perspective view of an upright vacuum cleaner, according to the preferred embodiment of the present invention;

[0008] FIG. **2** is an exploded view of an upper portion the vacuum cleaner of FIG. **1**, according to the preferred embodiment of the present invention;

[0009] FIG. **2**A is an exploded view of a portion of the upper housing of the vacuum cleaner of FIG. **1** showing the detail of the mode control arrangement; according to the preferred embodiment of the present invention;

[0010] FIG. **2**B is a front view of a cutaway portion of the mode control knob for the vacuum cleaner of FIG. **1**, according to the preferred embodiment of the present invention;

[0011] FIG. **3** is an exploded view of a foot portion of the vacuum cleaner of FIG. **1**, according to the preferred embodiment of the present invention;

[0012] FIG. 3A is perspective view of the vacuum cleaner foot of FIG. 3 with the hood removed to show the suction nozzle height adjustment arrangement and the agitator drive disconnect arrangement, according to the preferred embodiment of the present invention;

[0013] FIG. 3B is an enlarged perspective view of the automatic suction nozzle height adjustment and agitator drive disconnect arrangement removed from the foot portion shown in FIG. 3, according to the preferred embodiment of the present invention;

[0014] FIG. 3C is an exploded perspective view of the manual suction nozzle height adjustment and agitator drive disconnect arrangement, according to an alternate embodiment of the present invention;

[0015] FIG. 3D is an enlarged perspective view of the manual suction nozzle height adjustment and agitator drive disconnect arrangement removed from the base portion shown in FIG. 3C, according to an alternate embodiment of the present invention;

[0016] FIG. 4 is a side view of dirt cup for the vacuum cleaner of FIG. 1, according to the preferred embodiment of the present invention;

[0017] FIG. 4A is a bottom view of dirt cup of FIG. 4, according to the preferred embodiment of the present invention;

[0018] FIG. 4B is a cutaway front view of a portion of the dirt cup of FIG.4, according to the preferred embodiment of the present invention; and

[0019] FIG. 5 is a block diagram of the electrical system of the vacuum cleaner of FIG. 1, according to the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] An upright vacuum cleaner **10** according to a preferred embodiment of the present invention is illustrated byway of example in FIG. **1**. The vacuum cleaner **10** is of the type having a removable wand and hose assembly **50** for off-the-floor cleaning that when in the stored position, as shown in FIG. **1**, also serves as a handle for manipulating the vacuum cleaner **10** over the floor surface. A cantilever style handgrip **55** extending from the free end of wand and hose assembly **50** is provided for allowing the user to manipulate the cleaner **10** over the floor surface. The hose and wand assembly **50** can also be removed from the rear of the housing **200** for cleaning in the off-the-floor mode. The hose and wand assembly **50** is telescoping for allowing for user's of differing height. Various cleaning accessories (FIG. **2**) can be installed onto the suction end (not shown) of the hose and wand assembly **50** and stored in recesses on the rear of housing **200**.

[0021] Referring now to FIGS. **1**, **2**, **2**A, **2**B, **3**, **3**A, **3**B, **3**C and **3**D, the vacuum cleaner **10** is equipped with a dirt cup **500** which is fitted into a recess in the housing **200**. The dirt cup **500** has a latch **515** fitted into a pre-filter **503** that sits in the top of the dirt cup **500** for securing the dirt cup **500** into the recess in the housing **200**. The dirt cup **500** has a pivoting door **504** attached at the bottom for emptying the contents of the dirt cup for later disposal. The details of the dirt cup **500** are discussed more fully in detail hereinbelow.

[0022] Located immediately above the dirt cup **500** is a rotating filtration cartridge **602** that is visible through a translucent viewing window located in the front of a filtration housing **601**. The rotating filtration cartridge **602** acts as a final filter for the dirt laden air stream flowing that originated through the suction openings **116** located beneath the suction nozzle **130**. The motor-fan assembly **401** generates the suction that is applied to the suction nozzle **130** through the dirt cup **500** and filtration cartridge **602**. The filtration cartridge **602** is rotated so that a single segregated, longitudinal portion of the hollow interior is rotated past a valve (not shown) which allows ambient air to reverse flow through that portion of the filtration cartridge **601**. The ambient airflows through the filtration cartridge wall to clean the outer surface of the filtration cartridge wall for that portion of the filtration cartridge **602**. As the filtration cartridge **602** rotates through one complete **3600** revolution, the exterior of the filtration cartridge **602** is cleaned of the buildup of dust and dirt. In this manner the filtration cartridge **602** is continuously cleaned and filtration performance is maintained. A similar regenerative filtration arrangement was disclosed in U.S. patent application Ser. No. 10/731,380 filed on Dec. 8, 2003, and U.S. patent application Ser. No. 11/249,249 filed on Oct. 13, 2005, both of which are incorporated by reference as if fully rewritten herein.

[0023] The vacuum cleaner **10** includes a foot **100** with a suction nozzle **130** attached at the front. The vacuum cleaner **10** is of the type having an agitator **135** positioned within an agitator chamber (not shown) formed in suction nozzle **130**. The agitator chamber (not shown) communicates with the suction nozzle openings **116** and the agitator **135** rotates about a horizontal axis inside the agitator chamber (not shown) for loosening dirt from the floor surface. The loosened dirt is drawn into a suction duct **110***b* located behind and fluidly connected to agitator chamber (not shown) by a suction air stream generated by a motor-fan assembly **401**. The suction duct **110***b* directs the loosened dirt to a dirt cup **500** positioned in the upper housing **200**. Freely rotating support wheels **102** (only one of which is visible in FIG.**1**) are located to the rear of the foot **100**. In an alternate embodiment,the foot **100** could further include a transmission (not shown) and drive wheels (not shown)for propelling the vacuum cleaner **10** in a forward and reverse direction over a surface to be cleaned.

[0024] Located above the rotating filtration cartridge **602** is a rotary mode control member **20** for controlling the height of the suction nozzle **130** in relation to the floor surface and for disconnecting the rotary power to rotary agitator **135** for pre-selected suction nozzle **130** heights in relation to the floor surface. A push button member **21** is located in the center of the rotary mode control member **20** for switching the motor-fan assembly **401** on and off. Both the push button member **21** and rotary mode control member **20** are operatively connected to a control board **35** having electrical controls for controlling various features of the vacuum cleaner **10**. The details of the rotary mode control member **20** and push button member **21** are shown in the exploded view shown in FIG. **2**A. The rotary mode control member **20** and push button member **21** are mounted to the front side of an upper housing portion cover **205** which also serves as a housing for the filtration housing **601** described more fully hereinbelow. A variable switch or potentiometer **23** and an electrical switch **24** are mounted on a control

board **22** which is located behind the upper housing portion cover **205**. The rotary mode control member **20** is operatively connected to the potentiometer **23** for sending a signal of varying magnitude to the control board **35** to adjust the suction nozzle height according to the position of the potentiometer **23**. The potentiometer **23** can have variable settings or be equipped with discrete settings such as those shown in FIG. **2**B including high, medium, low and hard floor settings. The push button member **21** is operatively connected to a power switch **24** mounted the control board **35** for switching the power to the motor-fan assembly **401** on and off.

[**0025**] The rotary agitator **135** is supplied rotary power through a drive belt **142** which is tensioned and de-tensioned to connect and disconnect the rotary power according to the position of the rotary mode control member **20** selected by the user. The drive belt **142** is supplied rotary power by a pulley **145** which is driven by a v-grooved belt **147** that engages an upper portion **145***b* of the pulley **145**. The v-grooved belt **147** coupled to a grooved portion of stub shaft **401***a* extending from motor-fan assembly **401**. A grooved portion **145***a* of pulley **145** receives the drive belt **142** connected to rotary agitator **135**.

[**0026**] In the preferred embodiment of the invention, the mode control member **20** is electronically connected to a suction nozzle height adjustment motor **140** which varies the height of the suction nozzle **130** and foot **100** in relation to the surface to be cleaned. For pre-selected suction nozzle **130** height positions, such as for cleaning bare or hard floors, it may be desirous to disconnect connect the rotary power to the rotary agitator **135**. This is accomplished by a projection or tongue **140***b* extending from a cam portion **140***a* extending downwardly from the suction nozzle height adjustment motor **140**. The tongue **140***b* causes idler arm **141** to be rotated so a tensioner wheel **143** normally tensioning drive belt **142** is released and drive belt **142** is de-tensioned causing rotary agitator **135** to stop rotating. Oppositely, it may be desirous to connect the rotary power to the rotary agitator **135** when returning to cleaning floors having carpet. Moving the mode control member to one of the discrete positions for cleaning carpet causes the suction nozzle height adjustment motor **140** to rotate the tongue **140***b* extending from cam portion **140***a* to release the pressure against idler arm **141** causing tensioner wheel **143** to return to the normal position and once again the tension drive belt **142** causing rotary agitator **135** to stop rotating. A torsional spring **146** biases the idler arm **141** back to the normal position to tension drive belt **142** to cause rotary agitator **135** to rotate.

[**0027**] Referring now to more particularly to FIG. **2**, an exploded view of the upper housing of the vacuum cleaner **10** is shown. An upper housing shell **210** has a motor cavity **210***a* at the bottom for receiving the motor-fan assembly **401**. A motor cover **212** secures motor-fan assembly **401** into motor cavity **210***a* in upper housing shell **210**. A motor seal **402** located between the inlet side of motor-fan assembly **401** and the suction inlet end **610***a* of clean air duct **610**. The suction outlet end **610***b* is then connected to the filter housing cover **603***a* of filter housing **601**. A gasket **604** ensures a seal between filter housing cover **603***a* of filter housing **601**. Suction from motor-fan assembly **401** is then delivered to filter housing **601**. An electric motor **603** rotates filtration cartridge **602** so that a portion of filtration cartridge **601** is at all times subjected to a reverse flow of air flowing therethrough to remove the buildup of dust on the outer surface. The filtration cartridge **602** is partitioned on the hollow interior in the longitudinal direction and as the filtration cartridge **602** rotates a single longitudinal portion at a time is exposed to the ambient atmosphere through a special valve causing a reverse flow through that portion of the filtration cartridge **601**. The remaining portions of the filtration cartridge **601** have an air stream flowing therethrough in the opposite direction. A filter partition **607** serves as a pressure barrier between the portion of the outer filter being cleaned by the reverse flow and the remaining portions of the outer filter that are filtering finer dirt particles from the dirt laden air stream.

[**0028**] The suction delivered to the filter housing **601** causes a pressure drop in the forward portion of the dirt cup **500** to draw a dirt laden air stream into the dirt cup **500** originating at the suction nozzle inlets **116** located below suction nozzle **130**. A flexible duct portion **58** connects the suction duct **110***b* and **130***a* to the dirt cup **500** via another duct formed from a duct portion **210***b* integrally formed in the rear of upper housing shell **210** and a duct cover **225**. A gasket **511** seals the duct portion **210***b* to the dirt cup inlet **500***e* (FIG. **4**A). The dirt cup **500** has a partition **500***a* separating dirt cup **500** into a front portion and a rear portion. The front portion is for collecting debris collected from the suction nozzle **130** as previously described. The rear portion is for collecting debris removed from filtration cartridge **602** during the cleaning operation. The partition **500***a* serves to operate as a pressure barrier between the suction delivered to the front portion of dirt cup **500** from motor-fan assembly **401** and the air at ambient pressure causing reverse flow through filtration cartridge **602**. A flicker **612** is mounted in filtration housing **601** and in operative engagement with filtration cartridge **602** to vibrate the pleated edges of filtration cartridge **602** to aid in the removal of dust buildup. A spring **612***a* biases the flicker **612** against filtration cartridge **602**.

[**0029**] A pre-filter basket **503** is inserted into the open top of dirt cup **500** for filtering larger dirt particles and retaining them in the front portion of dirt cup **500**. The pre-filter basket **503** is of a truncated pyramidal shape that extends downwardly into the front portion of dirt cup **500**. A plurality of vertical axis holes in pre-filter basket **503** allow the cleaning suction to be delivered to the front portion of dirt cup **500** from filtration housing **601**. The more finer dust is then filtered from the dirt laden air stream by filtration cartridge **602**. A pre-filter basket gasket **504** seals the pre-filter basket **504** against the filtration housing.

[**0030**] A carrying handle **215** is provided above the upper housing portion cover **205** for carrying the vacuum cleaner **10** up the stairs and the like. A suction powered hand tool **75** can be stored in a pocket partially formed from the carrying handle **215**. One or more off-the-floor accessory tools including a crevice tool **65**, dusting brush assembly **66**, and furniture nozzle **67** can be stored in pockets integrally formed in the rear of upper housing shell **210**. The free end of the telescoping portion **56** of wand assembly **56** fits over a post (not shown) on the rear of upper housing shell **210** for sealing off the suction. The handle portion **55** is connected to a flexible hose portion **57** which is connected to the duct portion **225** on the rear of upper housing shell **210**. Thus, cleaning suction is delivered to the wand assembly **50** or the

suction nozzle **130** as previously described. The wand assembly **50** slides into a set of grooves (not shown) formed in the rear of upper housing shell **210** and is secured by a latch **220** which is depressed to release wand assembly **50** for off-the-floor use.

[**0031**] FIG. **3**, shown is an exploded view of the foot **100** of the upright vacuum cleaner **10** shown in FIG. **1**. The foot **100** is comprised of a base **110** which the remaining portions of the foot **100** are assembled to. A pair of rear wheels **102** are mounted on the rear for supporting the base **110** as it is propelled over the floor surface. A suction duct is partially-formed from a channel **110***b* integrally formed on the upper surface of the base **110**. The suction duct is also partially formed from a channel **130***a* integrally formed in a suction nozzle **130** that is mounted on top of and partially extending from the front of the base **110**. The suction nozzle **130** also has an agitator chamber wherein the rotary agitator **135** is installed for loosening dirt from the floor surface. A suction nozzle liner **131** fits into the upper surface of the agitator chamber formed in the suction nozzle **130** to complete the suction duct **130***a* extending from the forward edge of the agitator chamber and over the agitator chamber for directing the dirt laden air stream to the dirt cup **500** via the flexible suction duct **58**. A similar suction nozzle configuration was disclosed in U.S. Pat. Nods. 5,513,418, 6,002,402, 6,237,189, and 6,772,475, all of which are owned by a common assignee and incorporated by reference as if fully rewritten herein. A more thorough description of the proposed suction nozzle for the subject cleaner was disclosed in U.S. Provisional application No. 60/785,118 filed on Mar. 23, 2006 docketed as Hoover case 2839.

[**0032**] A bottom plate **115** fits to the bottom of suction nozzle **130** and has a plurality of suction inlets **116** formed therein for exposing the agitator **135** and suction nozzle **130** to the surface to be cleaned. A wheel carriage **105** with a pair of opposing wheels **106** fits into a channel **115***b* formed in a tongue **115***a* extending rearwardly from the bottom plate before the bottom plate **115** is installed on the underside of the agitator chamber. The wheel carriage **105** and wheels **106** support the front portion of the base **100** and suction nozzle **130** over the surface to be cleaned and is used to vary the height of the suction nozzle **130** over the surface to be cleaned by a lever arm **105***a* that extends from the wheel carriage **105**. The lever arm **105***a* is in operative engagement with a cam **140***a* on the bottom of the suction nozzle height adjustment motor **140** which urges against the lever arm **105***a* causing the wheel carriage **105** to be raised or lowered. The bottom plate **115** has a belt guard **115***c* integrally formed therein for receiving the belt **142** that rotates the rotary agitator **135** and partially surrounds a portion of the bottom of the rotary agitator **135** having a groove for receiving the belt **142**. The upper portion of the groove for receiving the belt **142** on rotary agitator is surrounded by a belt guard **110***a* that extends forwardly from base **110**. The opposing end of belt **142** is inserted into a groove **145***a* (FIG. **3**B) in pulley **145**.

[**0033**] The suction nozzle height adjustment motor **140** is fitted into a recess **11** Oh integrally formed in the upper surface of base **110** (see also FIG. **3**A). A tongue **140***b* extending from the cam portion **140***a* of the suction nozzle height adjustment motor **140** engages an ear **141***a* on idler arm **141** causes idler arm **141** to rotate and remove the tension placed against drive belt **142** by the tensioner wheel **143** extending from idler arm **141**. Idler arm **141** is otherwise biased by a torsional spring **146** such that the tensioner wheel **143** normally tensions drive belt **142** so that rotary agitator **135** rotates. It is desirable to de-tension drive belt **142** when the suction nozzle height adjustment motor **140** lowers the suction nozzle **130** to the position closest the floor surface for cleaning hard or bare floors. FIGS. **3**A and **3**B show the details of the suction nozzle height adjustment motor **140**, idler arm **141**, tensioner wheel **143**, drive belt **142**, rotary agitator **135** and pulley **145**.

[**0034**] A valve **160** is installed in the suction duct **110***b* in the base **110** to cut off suction to the suction nozzle **130** when the upper housing **200** is in the upright or off-the-floor use position. This makes full suction available for off-the-floor cleaning via wand assembly **50** (FIG. **1**). A front valve arm **161** is rotatably coupled to a rear valve arm **163** with a torsional spring **162** located therebetween for causing the valve **160** to be moved between the closed and open positions when upper housing **200** is moved from the upright or off the floor use position to the in use or floor cleaning position. The rear valve arm **163** is engaged by projection (not shown) on the upper housing **200** for causing front valve arm **161** to rotate valve **160** via a crank arm on valve **160** as the housing is moved between the upright or off the floor use position to the in use or floor cleaning position. The torsional spring **162** also causes the valve **160** to be normally biased into the closed position as when the housing **200** is normally in the upright position. A right trunnion cover **112** and left trunnion cover **112** pivotally secure the upper housing **200** to the base **110** (not shown). A hood **190** fits over the base **110** and suction nozzle **130** assembly. A recess **191** formed in hood **190** receives visual indicators for signaling the condition of the carpet or floor surface during cleaning to let the use know when dirt is being picked up and when the carpet is clean. A lens cover **192** fits over the recess **191** to cover recess **191** and the visual indicators.

[**0035**] In an alternate embodiment of the invention, and turning more particularly to FIGS. **3**C and **3**D, the suction nozzle height adjustment motor **140** of the preferred embodiment is replaced with a manual suction nozzle height adjustment arrangement **180** comprised of a knob **180**, cam portion **182**, and body portion **181**. The knob **180** protrudes through an aperture **191** in hood **190** so a user can manually turn knob **180** to adjust the height of the suction nozzle **130**. The cam portion **182** engages the lever arm **105***a* of wheel carriage **105** similar to the cam portion **140***a* of the suction nozzle height adjustment motor **140** does in the preferred embodiment. The rotary agitator **135** is also de-tensioned similarly by idler arm **141** when a projection or tongue **182***a* on cam portion **182** engages idler arm **141** when the manual suction nozzle height adjustment arrangement **180** is rotated to the bare or hard floor position. Rotating the tongue **182***a* against the ear **141***a*of idler arm **141** causes wheel tensioner **143** to be moved away from belt **142** causing belt **142** to remove the tension normally put on drive belt **142** by wheel tensioner **143**. The loss of tension in drive belt **142** causes rotary agitator **135** to stop rotating. When tongue **182***a* is released from ear **141** a of idler arm **141**, the torsional spring **146** causes the idler arm **141** to be rotated back to the normal position and wheel tensioner **143** again causes belt **142** to be tensioned causing rotary agitator **135** to rotate.

[**0036**] Referring now to FIGS. **4**,**4**A and **4**B, shown is a dirt cup **500** for a vacuum cleaner **10** as shown in FIG. **1**. The

dirt cup **500** has an opening **500***h* at the top and an opening **500***g* at the bottom. A pivoting lid **504** attached at the bottom prevents debris collected on the interior from falling out the bottom. The pivoting lid **504** opens by moving in the direction of arrow **900**. A grip handle **500***f* is located at the front edge at the top of the dirt cup **500**. The pivoting lid **504** is pivotally connected to one side of the bottom of the dirt cup **500** by hinges **500***c*. A release lever **500***d* is located directly above the hinges **500***c* for operating a sliding member **502** that traverses the underside of the dirt cup lid **504**. One end of the sliding member **502** is connected to a lever **501** which pulls the sliding member **502** in the direction of arrow **902**. A resilient portion **502***b* of sliding member **502** allows the sliding member **502** to flex around the bottom of the dirt cup **500** as the lever **501** is depressed in the direction of arrow **901**. The free end of sliding member **502** comprises a tongue **502***a* which is disengaged from a groove **500***b* cut in the front sidewall of a rim portion **500**i of dirt cup **500**. The rim portion **500** i of dirt cup **500** is for seating dirt cup **500** in the recess in upper housing **200**. When tongue **502***a* is disengaged from groove **500***b* the lid **504** is free to pivot to the open position as shown in FIG. **4**. Torsional springs **505** located in the hinges **500***c* attaching lid **504** to dirt cup **500** bias the lid into the open position when lever **501** is depressed. A pair of sidewall extending resilient members **503** return sliding member **502** to the normally closed position when lever **501** is released. The resilient members **503** urge against a pair of stops **504***a* located on the underside of lid **504**. A pair of guides **504***d* on the underside of lid **504** guide the tongue **502***a* of sliding member **502** into groove **500***b* when lid **502** is moved to the closed position. Thus, lid **504** is latched until lever **501** is depressed.

[**0037**] Referring now to FIG. **5**, shown is a block diagram of the electronic components and wiring of the electrical system for the subject vacuum cleaner **10** (FIG. **1**). An electrical power cord **26** provides ordinary household alternating current to a power printed circuit board **35** (also shown in FIG. **2**) which distributes electrical power to the various electrical components. The power printed circuit board **35** distributes power to a height adjustment power printed circuit board **22** (also shown in FIG. **2**) containing the potentiometer **23** for sending a signal of varying magnitude to the control board **35** to adjust the suction nozzle height via suction nozzle height adjustment motor **140** and power switch **24** for turning the motor-fan assembly **401** on and off. The power printed circuit board **35** also provides power to the filter motor **603**, a microphone **425** for detecting dirt particles removed from the floor surface, a printed circuit board for an electronic dirt finder system (EDF) **29**, and a printed circuit board **28** for a hall effect sensor used to detect the stall of the rotary agitator **135** (FIG. **3**) if obstructed. The printed circuit board for an electronic dirt finder system (EDF) **29** could be installed beneath the recess **191** (FIG. **3**) containing the visual indicators for detecting the removal of dirt particles and when the carpet or surface has been cleaned of dirt particles. Such en electronic dirt finder system was disclosed in U.S. Pat. No. 5,608,944, owned by a common assignee and incorporated by reference as if fully rewritten herein. The hall effect sensor circuit board **28** could be located on base **110** in proximity to the suction nozzle **130** (FIG. **3**). A lamp socket **426** is located or near motor-fan assembly **401** for receiving a lamp for lighting the path in front of vacuum cleaner **10** (FIG. **1**). The lamp socket **401** is electrically connected to and receives power from motor-fan assembly **401**. The height adjustment printed circuit board **22** could include a microprocessor (not shown) that could be pre-programmed with the various height and power settings for the suction nozzle height adjustment motor **140** and the motor-fan assembly **401**.

[**0038**] Accordingly, the mode control arrangement for a floor care appliance is simplified, provides an effective, inexpensive, and efficient arrangement which achieves all of the enumerated objectives. While there has been shown and described herein a single embodiment of the present invention, it should be readily apparent to persons skilled in the art that numerous modifications may be made therein without departing from the true spirit and scope of the invention. Accordingly, it is intended by the appended claims to cover all modifications which come within the spirit and scope of the invention.

1. A mode control arrangement for a floor care appliance, comprising:

a suction nozzle for cleaning a surface, said suction nozzle being capable of being moved from a first position in highest relation to a surface to be cleaned to a second position in closest relation to the surface to be cleaned or one or more positions somewhere in between said first and second positions;

a rotary mode control member having a first and second position representing the height of said suction nozzle, wherein said first position represents said first position of said suction nozzle and the second position represents said second position of said suction nozzle and said rotary mode control member could include one or more positions between said first and second positions wherein said one or more positions represent a position of said suction nozzle located in between said first and second positions of said suction nozzle; a suction nozzle height adjustment motor electronically controlled by said rotary mode control member;

a rotary agitator;

a rotary power source;

a belt for transmitting rotary power from said rotary power source to said rotary agitator;

an idler arm capable of being moved from a first position to a second position,

a belt tensioner located on said idler arm wherein said belt tensioner tensions said drive belt when said idler arm is moved into said first position and de-tensions said drive belt when said idler arm is moved into said second position;

wherein a projection on said suction nozzle height adjustment motor engages said idler arm to move said idler arm between said first and second positions when said rotary mode control member is moved to one of said first and second positions or to one of said one or more positions between said first and second positions.

2. The mode control arrangement for a floor care appliance of claim 1, wherein said first position of said suction nozzle is for cleaning hard or bare floors and said projection on said suction nozzle height adjustment motor moves said

idler arm into said first position to de-tension said drive belt transmitting rotary power from said rotary power source to said rotary agitator.

3. The mode control arrangement for a floor care appliance of claim 1, wherein said second position of said suction nozzle is for cleaning carpet of deep pile height and said projection on said suction nozzle height adjustment motor does not engage said idler arm and said idler arm is biased into a second position and drive belt is tensioned for transmitting rotary power from said rotary power source to said rotary agitator.

4. The mode control arrangement for a floor care appliance of claim 1, wherein said rotary power source is a motor-fan assembly which also provides the suction for generating a dirt laden air stream originating at said suction nozzle.

5. The mode control arrangement for a floor care appliance of claim 1, wherein said suction nozzle height adjustment motor includes a cam portion wherein said projection extends from for engaging said idler arm when said suction nozzle is moved to said second position.

6. The mode control arrangement for a floor care appliance of claim 1, wherein said cam portion engages a lever arm extending from a wheel carriage for raising and lower said suction nozzle between said first and second positions and said one or more positions between said first and said second positions.

7. The mode control arrangement for a floor care appliance of claim 1, wherein moving said rotary control member to said first position moves said suction nozzle to said first position for cleaning deep pile carpets and moving said rotary control member to said second position moves said suction nozzle to said second position to clean hard or bare floors, and wherein said positions of said rotary control member in between said first and second positions could represent predetermined heights of the suction nozzle for cleaning pre-determined carpets of a specific pile height.

8. The mode control arrangement for a floor care appliance of claim 1, wherein said rotary mode control member is operatively connected to a microprocessor pre-programmed with data for controlling the suction nozzle height adjustment motor for moving said suction nozzle between said first and said second positions or said one ore more positions between said first and second positions.

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